

CLAIMS

1. A method for determining a compact model to transcribe a language acoustically based on well-defined basic phonetics, said method comprising:

extracting phonetic information regarding said language;
defining, based on said extracted information, phonological and phonetic units associated with said language;
identifying variations in said language;
developing a maximal set based on said defined phonological units, phonetic units, and identified variations in said language, and
reducing said maximal set to a minimal set of phonemes and allophones, thereby providing for a compact model for acoustically transcribing said language.

2. A method for determining a compact model to transcribe a language acoustically based on well-defined basic phonetics, as per claim 1, wherein said step of extracting information further comprises:

identifying terminological problems associated with said language;
identifying transcription problems associated with said language;
extracting all phonological and phonetic units associated with said language,
and

selecting a representative symbol for the transcription alphabet.

3. A method for determining a compact model to transcribe a language acoustically based on well-defined basic phonetics, as per claim 1, wherein said maximal set comprises any of, or a combination of: phonemes, allophones, rules governing the selection of allophones, a set of examples, and transliteration symbols.

4. A method for determining a compact model to transcribe a language acoustically based on well-defined basic phonetics, as per claim 1, wherein said step of reducing said maximal set further comprises reducing an automatic speech recognition phonetic set.

5. A method for determining a compact model to transcribe a language acoustically based on well-defined basic phonetics, as per claim 4, wherein said step of reducing an automatic speech recognition phonetic set further comprises the use of diacritics, graphemes, and allophones.

6. A method for determining a compact model to transcribe a language acoustically based on well-defined basic phonetics, as per claim 1, wherein said step of reducing said maximal set further comprises reducing a text-to-speech phonetics set.

7. A method for determining a compact model to transcribe a language acoustically based on well-defined basic phonetics, as per claim 6, wherein said step of reducing an text-to-speech phonetics set is accomplished by using allophones and adding symbols representing the phoneme to be geminated.

8. A method for determining a compact model to transcribe a language acoustically based on well-defined basic phonetics, as per claim 1, wherein said transcription alphabet is in compliance with the International Phonetics Alphabet (IPA).

9. A method for determining a compact model to transcribe a language acoustically based on well-defined basic phonetics, as per claim 1, wherein said language is any of the following: modern standard Arabic (MSA), classical Arabic, or colloquial Arabic.

10. A method for determining a compact model to transcribe a language acoustically based on well-defined basic phonetics, as per claim 1, wherein said phonetic information is extracted over a network.

11. A method for determining a compact model to transcribe a language acoustically based on well-defined basic phonetics, as per claim 2, wherein said network is any of the following networks: local area networks (LAN), wide area networks (WAN), Internet, HTTP-based networks, or wireless networks.

12. A voice control system utilizing a compact model to transcribe a language acoustically based on well-defined basic phonetics, said system comprising:

a computer system;

a microphone, said microphone interfacing with said computer system, said microphone capable of receiving voice input in said language,

a multimedia kit including full duplex sound card, said multimedia kit interfacing with said computer system, and said multimedia kit receiving said voice inputs from said microphone, and

said computer system receiving said voice input from said multimedia kit and phonetically analyzing said voice inputs using a stored compact set of phonetic alphabets thereby enabling translation of voice-to-text based on said stored compact set of phonetic alphabets.

13. A voice control system utilizing a compact model to transcribe a language acoustically based on well-defined basic phonetics, as per claim 12, wherein said multimedia kit further comprises a built-in automatic speech recognition (ASR) utility.

14. A voice control system utilizing a compact model to transcribe a language acoustically based on well-defined basic phonetics, as per claim 12, wherein said

multimedia kit recognizes human voice and interprets it into corresponding actions without being speaker dependent.

15. A voice control system utilizing a compact model to transcribe a language acoustically based on well-defined basic phonetics, as per claim 14, wherein said speaker dependant includes gender or age.

16. A voice control system utilizing a compact model to transcribe a language acoustically based on well-defined basic phonetics, as per claim 12, wherein said compact set of phonetic alphabets is accomplished using diacritics, graphemes, and allophones.

17. A voice control system utilizing a compact model to transcribe a language acoustically based on well-defined basic phonetics, as per claim 12, wherein said compact set of phonetic alphabets are compliant with the International Phonetics Alphabet (IPA) standard.

18. A voice control system utilizing a compact model to transcribe a language acoustically based on well-defined basic phonetics, as per claim 12, wherein said language is any of the following: modern standard Arabic, classical Arabic, or colloquial Arabic.

19. A voice control method utilizing a compact model to transcribe a language acoustically based on well-defined basic phonetics, said method comprising:

receiving voice inputs in said language via a microphone;

phonetically analyzing said received voice inputs using a computer-based system,

and

said computer-based system analyzing said voice input using a stored compact set of phonetic alphabets, thereby enabling translation of voice-to-text based on said stored compact set of phonetic alphabets.

20. A voice control method utilizing a compact model to transcribe a language acoustically based on well-defined basic phonetics, as per claim 19, wherein said compact set of phonetic alphabets is accomplished using diacritics, graphemes, and allophones.

TABLE 1 *Arabic Phonetic Alphabet Table*

The Table Supports:

- 1) Well Educated Pronunciation (Used in Text To Speech)
- 2) In the Sound Features Field
- a. (+) = Voiced
 - b. (-) = Voiceless

| L.Name | A. letter | Sound Features | New Alphabet | Examples | Transcription |
|--------|-----------|---|-------------------|------------------------|---|
| Alif | Ā | glottal plosive - epiglottal fricative + | C | ĀōĪāōÉ āōĀōĐōö | Ce.dll.le mu.0e4.4ln |
| Ba | É Ēø | bilabial plosive + geminated bilabial plosive + | b B | ÉóÇøōáóÉ ĒöäóĒöóĀ | b1.8l.le te.ne.Be.0e |
| Ta | Ē Ēø | alveolar plosive - geminated alveolar plosive | t T | ĒóĪūāóĪā ÓöĒøóÉ | teh.l3l sl.Te |
| Tha | Ē Ēø | dental fricative - geminated dental fricative | F FF | ĒöäóÇäöĪóÉ āöβöĒøóŸ | Fe.mE.ni.je mu.keF.Fef |
| Jim | Ī Īø | velar plosive + alveolo-palatal fricative + Geminated velar plosive + | g 5 G 55 | ĪóāūōóÉ āöĒöŸöĪōā | gel.se 5et.se mu.te.Ve.Gll mu.te.Ve5.5ll |
| Ha | Ī Īø | Pharyngeal fricative - Geminated pharyngeal fricative - | h hh | ĪóōōŊó ōōĪōóÉ | ha.6A.rA Slh.ha |
| Kha | Ī Īø | uvular fricative - geminated uvular fricative - | x xx | ĪóāūōóÉ ÇáōōōĪōóÇä | xem.se Ces.sex.xEn |
| Dal | Ī Īø | alveolar plosive + geminated alveolar plosive + | d D | Īóūūā āōĪøó | DeVm me.De |
| Dal | Đ | dental fricative + | 4 | ĀĐóÇä | CE.4En |

RS

ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ

| Φθ | geminated dental fricative + | 44 | ΨάθρόϗΕϊόϗ | Ce4.4E.tlj |
|------|--|----|--------------|-----------------|
| Ra | Ñ r flap not retroflexed + | r | ÑόάúΌϊό | ram.s3s |
| | Ñ alveolar trill + | R | ΆόπόÑό | Ce.qA.RA |
| Za | Ö alveolar fricative + | z | ΌόϊúÉ | Zejt |
| | Ö geminated alveolar fricative + | zz | ΊόΌόάό | xez.ze.na |
| Sin | Ó alveolar fricative - | s | ΌόÉϊά | se.b3l |
| | Ó geminated alveolar fricative - | ss | ϗόάΌόόÉúÉ | Ces.sebt |
| Shin | Ö post alveolar fricative - | c | ΌόÑöβόÉ | ce.ri.ke |
| | Ö geminated post alveolar fricative - | cc | ϗάΌόόάæθόϗΥ | Cec.ce.WEf |
| Sad | Ö pharyngealised s - | S | Όόάθöï | SAI.I3 |
| | Ö geminated pharyngealised s - | SS | ϗάΌόόϊόÉĬ | CAS.SA.J1d |
| Dad | Ö pharyngealised d + | 6 | ΊόΌόÑό | hA.6A.rA |
| | Ö geminated pharyngealised d + | 7 | ΥöÖθόÉ | fl.7A |
| Ta | Ø pharyngealised t - | 8 | θόάόÚό | 8A.la.Ve |
| | Ø geminated pharyngealised t - | 9 | ϗάÉόθόϗÑöïόÉ | Cel.bA.92.rl.Je |
| Za | Ü pharyngealised <u>dal</u> + | Z | Üόάθό | ZAl.la |
| | Ü geminated pharyngealised <u>dal</u> + | ZZ | ϗάÜθόάόϗă | CAZ.ZA.I1m |
| Ain | Ü pharyngeal fricative + | V | ÜόÑúÖ | VAr6 |

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1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.

| Úø | geminated pharyngeal fricative + | VV | ÃóÖüÚøÉ | Ce.cIV.Ve |
|-------|--|----|-----------------|------------------|
| Ghain | | | | |
| Ũ | uvular fricative + | P | ÇáŒøðÈóÇŨóÉ | CeS.Si.b1.Pa |
| Úø | geminated uvular fricative + | PP | ÉóæóŨøá | te.weP.Pol |
| Ý | labiodental fricative - | f | ÇáúÍóÝúá | Cel.hefl |
| | labiodental fricative + | v | ÊáðíÝðŒíðæä | tl.li.vls.jOn |
| Ýø | geminated labiodental fricative - | ff | ÇöŒúÉóÍóÝøó | Cls.te.xef.fe |
| p | uvular plosive - | q | þóŒúŨ | QASr |
| þø | geminated uvular plosive - | Q | Íóþøáð | ha.QA.Hu |
| ß | velar plosive - | k | ßáðøðíðóÉ | kul.li.Je |
| ßø | geminated velar plosive - | K | ÉððßøðáðóÉ | te.me.Ke.net |
| á | alveolar lateral approximant + | l | íðáóÉððí | ju.le.B3 |
| áø | geminated alveolar lateral approximant + | LL | Çááá | CAL.L2X |
| | geminated pharyngealised l + | ll | ÇóáúáðŒóóáðóíóÉ | Cel.mu.sel.le.ha |
| ã | bilabial nasal + | m | ãóŒúíŒí | mes.5ld |
| ãø | geminated bilabial nasal + | mm | ÇááóÇãøóÉ | Cel.Hem.me |
| ä | alveolar nasal + | n | äóŨáä | ne.Vem |
| | velar nasal + | N | ÇóäúßóŒó | CaN.ka.ra |
| äø | geminated alveolar nasal + | nn | ÉóŒóäðøóŨó | ta.San.na.Va |
| â | glottal fricative - | X | Ýóäúí | feXd |
| | glottal fricative + | H | ŨóäðŒó | ZA.Ha.rA |
| âø | geminated glottal fricative + | HH | Éóæóäðøáð | ta.weH.He.me |

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Table 1. The phonetic transcription of the Greek letters.

| waw | æ | labio-velar approximant + | W | ĩōæóá | du.wel |
|-------|-------------------------|-------------------------------------|---|------------|--------------|
| ya | æø | geminated labio-velar approximant + | W | ÇÁÊøóáæøðĖ | Ce.Te.le.WuF |
| | ĩ | palatal approximant + | j | íóĩúUōā | jed.Vom |
| | ĩø | geminated palatal approximant + | J | ÇÁÊóĩíóĩøā | Ce.Te.de.Jon |
| | | | | | |
| fatha | | open mid-front | e | ĖóĩúŃōĖÉóĖ | te5.rl.be |
| | | open front | a | Ōóĩíóó | SA.da.qa |
| | | low back | A | póŌóĩ | qA.62 |
| kasra | | mid-high mid-front short | i | ÇääøøÇpöĩ | Cen.n1.qld |
| | | close front | ı | Äöáóĩ | Çı.İĖ |
| | | close back | u | ÄöøóáóÇĖ | Cum.me.HİEt |
| damma | | open – mid back | o | ÇáÚøŃóY | Cel.Po.raf |
| | | | | | |
| alif | mid front long | | E | ÇáŌøóĖóÇĖ | Cec.ce.bEb |
| | open front | | 1 | ÇáúíóÇŌöĖ | Cel.hE.slb |
| | low back | | 2 | ÇöäúYöŌóÇá | Cln.fi.S2l |
| waw | close back | | U | ĖóĩōæŃ | te.dUr |
| | open mid back | | O | ĩōβúĖōæŃ | duk.tOr |
| | mid-high mid-front long | | Y | ÄöäúĖöĩŃ | Cem.bYr |
| ya | close front | | 3 | ŃóÆöĩŌ | ra.03s |

TABLE 2

| | |
|------|-------|
| wegd | æóİúİ |
| waqt | æóPúĖ |
| WA6V | æóÖúÚ |

(Different symbols that represent short Fatha)

| | |
|--------|------|
| NE.0Im | äÇÆã |
| N1.qId | äÇPİ |
| N2.6Ig | äÇÖİ |

(Different symbols that represent long Fatha)

TABLE 3

| | |
|-----------|----------|
| Ben.nEC | ĖóäøóÇÁú |
| Ra.B3 | ŃóĖøöí |
| 8A.lab | ØáĖ |
| CA.9A.lab | ÇáØøóáĖ |

(Different symbols that represent gemination)

TABLE 4

Phonetic Alphabet for Arabic Speech Recognition System

| English Representation | Arabic Letter | SAKHR Phonetic Symbol | Arabic Example |
|------------------------|---------------|-----------------------|----------------|
| Plosives | | | |
| Hamza | أ | F | آÓĬ |
| Ba | ب | b | ÉíĒ |
| Dal | د | d | Ĭáíá |
| Dad | ڈ | d%K | ÖáíÑ |
| Jim | ج | g | ĬÉá |
| Kaf | ك | k | βáÝ |
| Qaf | ق | q | þÉá |
| Ta | ت | t | ĒāÑ |
| Ta | ث | t%K | ØÑþ |
| Nazals | | | |
| Mim | م | m | āāÖá |
| Nun | ن | n | āĬā |
| Trills | | | |
| Ra | ر | r | Ñāā |
| Fricatives | | | |
| Dal | ذ | D | ðäĒ |
| Za | ز | D%K | Úá |
| Ain | ع | F7 | Úíä |
| Ghain | غ | R7 | Úíä |
| Shin | ش | S | ÖāÖ |
| Tha | ث | T | ĒþĒ |
| Kha | خ | X | ĬÑĬ |
| Fa | ف | f | ÝÑ |
| Ha | ه | h | āĬÑ |
| Ha | ح | h> | ĬÑĒ |
| Sin | س | s | ÖāÇÁ |
| Sad | ص | s%K | ÖĬĬ |
| Za | ظ | z | Öíä |
| Approximants | | | |
| Ya | ي | j | íæā |
| Lam | ل | l | áæā |

| | | | |
|---------------------|----------|-----------|-------------|
| Waw | æ | w | æáĭ |
| Long Vowels | | | |
| Alif | ā | a: | ĪÈÇá |
| Ya | ī | i: | Īíá |
| Waw | ē | u: | ÈæÑ |
| Short Vowels | | | |
| Fatha | ó | a | Īāá |
| Kasra | ö | i | āÑäÉ |
| Damma | õ | u | óÑÈ |